cation or practice of the invention disclosed herein. It is intended that the specification and these examples be considered as exemplary only. While the invention has been described in connection with preferred embodiments, it will be understood by those skilled in the art that other variations and modifications of these preferred embodiments described above can be made without departing from the scope of the invention.

We claim:

1. An apparatus for performing a plurality of assays, comprising:

an axially rotatable substrate comprising a plurality of concentrically arranged, non-interconnected reaction sites;

means for rotating and controlling the rotation of said substrate;

a multi-function head comprising a fluid dispenser adapted to convey a fluid to said reaction sites, a fluid dispenser outlet, and a readout device;

means for identifying at least one of said reaction sites; and

means for aligning said multi-function head such that said fluid dispenser outlet may be aligned with at least one of said reaction sites.

2. The apparatus of claim 1, wherein said means for rotating is adapted to rotate and stop said substrate at an adjustable speed and controls the rotation of said substrate by adjusting said speed, acceleration, and a direction of rotation.

3. The apparatus of claim 1, wherein said means for rotating is controllable to rotate said substrate at speeds which creating a centrifugal force for removing a portion of said fluid from said reaction site.

4. The apparatus of claim 1, wherein said multi-function head includes a fluid dispenser movably mounted on a rail, said rail being oriented substantially parallel to a surface of said substrate, and wherein said means for aligning comprises a linear stepper motor for positioning said fluid dispenser along said rail such that said fluid dispenser outlet is directed toward said rotated substrate.

5. The apparatus of claim 4, wherein said rail transects said substrate.

6. The apparatus of claim 4, wherein said means for rotating comprises a rotary stepper motor.

7. The apparatus of claim 4, wherein said multi-function head is mounted on said linear stepper motor.

8. The apparatus of claim 4, wherein said means for identifying includes a sensor mounted on said multi-function head.

9. The apparatus of claim 8, wherein said sensor receives a signal emanating from said substrate.

10. The apparatus of claim 8, wherein said sensor transmits an interrogating signal and receives a locating signal.

11. The apparatus of claim 8, wherein said sensor reads a locating mark on said substrate's surface.

12. The apparatus of claim 8, wherein said sensor reads a locating mark on said substrate's surface.

13. The apparatus of claim 4, wherein said means for aligning comprises a computer having a memory for storing a start location on said substrate's surface for said multi-function head and said computer provides movement signals to said rotary stepper motor and linear stepper motor, whereby said motors align said multi-function head to allow said fluid dispenser to be substantially aligned over at least one of said reaction sites.

14. The apparatus of claim 1, wherein said multi-function head comprises a chemical reaction detection mechanism including an electromagnetic energy source and an electromagnetic energy receiver, whereby electromagnetic energy is directed into a first reaction site of said plurality of reaction sites by said source and electromagnetic energy generated in said first reaction site is received and analyzed to detect a chemical reaction or the products thereof by said receiver.

15. The apparatus of claim 14, wherein said electromagnetic energy source includes an optic fiber coupled to a light source, whereby light generated by said light source is directed into said at least one reaction site, and wherein said electromagnetic energy receiver includes a optic fiber functionally coupled to a photomultiplier having a bandpass filter, whereby an electrical signal is generated and transmitted to a computer to detect said chemical reaction.

16. The apparatus of claim 14, wherein at least one of said reaction sites is a geometric cavity formed in said substrate, said geometric cavity having a plurality of surfaces which are oriented to allow said electromagnetic energy to reflect within said cavity to increase an electromagnetic energy path length.

17. The apparatus according to claim 16, wherein reflective barriers are formed on a periphery of said cavity to prevent electromagnetic interference from an adjacent cavity.

18. The apparatus of claim 1, wherein said multi-function head comprises a chemical reaction detection mechanism including an electromagnetic energy receiver, whereby electromagnetic emission caused by chemical or biological reactions in at least one of said reaction sites are channeled to an electromagnetic energy detector for detection.

19. The apparatus of claim 1, wherein at least one of said reaction sites is a geometric cavity formed into said substrate.

20. The apparatus of claim 1, wherein said substrate is a manufactured from a material selected from the group consisting of glass, ceramics, semiconductor materials, plastics, composites, and combinations thereof.

21. The apparatus of claim 1, wherein said substrate includes solid support structures formed within said reaction sites which provide a plurality of points at which probes affix to said reaction sites.

22. The apparatus of claim 21, wherein said structures are formed from an electrometal material.

23. The apparatus of claim 1, wherein said fluid comprises discrete amounts of a fluid aliquot and a separating fluid, and said dispenser comprises a pump, a suction device adapted to draw a stream from said dispenser and a timing device for controlling said suction device, wherein said pump alternately draws a first discrete amount of said fluid aliquot and a second discrete amount of said separating fluid into a dispenser tube and delivers a serialized fluid of said fluid aliquot and said separating fluid to said dispenser under controlled pressure.

24. The apparatus of claim 23, wherein said timing device measures a flow rate of said stream through said dispenser tube and deactivates and subsequently reactivates said suction device to allow a portion of said first discrete amount of said fluid aliquot to be delivered to at least one of said reaction sites.

25. The apparatus of claim 24, wherein said flow sensor component is a plurality of magnetic beads and said flow senor is a magnetic sensor.

26. The apparatus of claim 23, wherein said first discrete amount of said fluid aliquot is substantially identical to said second discrete amount of said separating fluid, wherein said fluid aliquot includes a flow sensor component, and wherein said timing device includes a flow sensor for detecting said flow sensor component as said flow sensor component passes said sensor.

27. The apparatus of claim 1, wherein said fluid comprises a discrete amount of a fluid aliquot and of a separating fluid and said fluid dispenser comprises a pump, a valve mechanism, a suction device, and a timing device, wherein

said pump draws a first discrete amount of said fluid aliquot and a second discrete amount of said separating fluid into a dispenser tube for delivering a serialized fluid of said fluid aliquot and said separating fluid to said dispenser under controlled pressure,

a first portion of said serialized fluid is dispensed from said dispenser to at least one of said reaction sites

said suction device removes an unwanted portion of said first portion of said serialized fluid, and

said timing device controls said valve mechanism and said suction device.

28. The apparatus of claim **27**, wherein said dispenser extends substantially perpendicular to a direction of fluid flow within said dispenser tube and said valve mechanism comprises a controller and a valve controlled by said controller, said value being positioned downstream from said dispenser and said controller being controlled by said timing device, such that when said valve is closed, said fluid flows to said dispenser outlet.

29. The apparatus of claim **1**, further comprising a valve mechanism comprising a controller and a valve controlled by said controller, said valve for controlling fluid flow from said dispenser, wherein said dispenser extends substantially perpendicular to a direction of fluid flow within said dispenser tube, and wherein said valve being positioned downstream from said dispenser and said controller is controlled by a timing device such that when said valve is closed, said fluid flows to said dispenser outlet.

30. The apparatus of claim **29**, wherein said timing device measures a flow rate of said fluid flow through said dispenser tube.

31. The apparatus of claim **29**, wherein said valve mechanism comprises

a four-way valve in said dispenser tube;

a first controller and a first valve controlled by said first controller, said first valve being positioned downstream from said four-way connection;

a second controller and a second valve controlled by said second controller, said second valve being positioned upstream from said four-way connection, and wherein

said dispenser extends from a first orifice of said four way connection such that said first controller and said second controller are controlled by said timing device and when said first and said second valves are closed, a dispenser fluid is pumped through said four-way connection and forces said fluid to said disperser outlet.

32. The apparatus of claim **1**, wherein said fluid dispenser ejects a micro-droplet stream of said fluid from said dispenser and an electrostatic accelerator and deflector directs said micro-droplet stream to at least one of said reaction sites.

33. The apparatus of claim **1**, wherein said means for identifying includes a light source and a florescence detector and wherein a plurality of said fluid aliquot is delivered to said reaction sites, and wherein said fluid includes a flourophor, whereby florescence occurs in at least one of said reaction sites.

34. The apparatus of claim **1**, wherein said substrate comprises a plurality of layers of a semiconductor material, and wherein an electronic element is formed on said semiconductor material and jointed to at least one of said reaction sites.

35. The apparatus of claim **34**, wherein said at least one electronic element is selected from the group consisting of transponders, heating coils, temperature sensors, electric field generating elements, photosensing elements, electrophoresing elements, denaturing elements, chemically sensitive gates, ion sensitive gates, interdigitated arrays, and combinations thereof.

36. The apparatus of claim **34**, wherein said electronic element comprises a plurality of interconnected electronic elements.

37. The apparatus of claim **36**, further comprising a spindle around which said substrate rotates and wherein a pair of said electronic elements are radially interconnected through said spindle.

38. The apparatus of claim **36**, wherein said pair of electronic elements are axially interconnected.

39. The apparatus of claim **36**, further comprising a multiplexor for interconnecting said electronic elements.

40. The apparatus of claim **1**, further comprising a electromechanical element that is formed on said substrate adjacent at least one of said reaction sites.

41. The apparatus of claim **40**, wherein said electromechanical element produces a vibration to agitate said fluid within at least one of said reaction sites.

42. The apparatus of claim **1**, wherein said means for rotating comprises a first rotary stepper motor, and wherein said dispenser outlet is mounted on a pivot arm and said pivot arm is mounted on a secondary stepper motor, such that said dispenser outlet is pivotably controllable over said rotatable substrate.

43. The apparatus of claim **1**, wherein said substrate and said fluid dispenser are enclosed within an air-tight container.

44. The apparatus of claim **1**, wherein at least one of said reaction sites comprises a geometric cavity formed in said substrate, said geometric cavity having a shield structure to prevent fluid loss from said reaction site.

45. The apparatus of claim **44**, further comprising a pressure control device for controlling atmospheric pressure within said container.

46. The apparatus of claim **1**, wherein said multifunctional head comprises a plurality of fluid dispensers.

47. The apparatus of claim **1**, wherein said apparatus includes at least about 20,000 radially arrayed reaction sites.

48. The apparatus of claim **1**, wherein said fluid dispenser is adapted to convey an amount less than about 0.5 μl of said fluid to each of said reaction sites.

49. An apparatus for performing a plurality of assays comprising:

an axially rotatable substrate comprising a plurality of concentrically arranged non-interconnected reaction sites;

means for rotating said substrate;

a multi-function head including a fluid dispenser adapted to convey a fluid to each said reaction sites, a fluid dispenser outlet, and a readout device;

means for identifying at least one of said reaction sites; and

means for aligning said multi-function head such that said fluid dispenser outlet is substantially aligned with at least one of said reaction sites, wherein said means for rotating is controllable to rotate said substrate at a speed to allow a portion of said fluid be removable from at least one of said reaction sites by a centrifugal force generated by the rotation of said substrate.

50. The apparatus of claim **49**, wherein said multifunctional head comprises a plurality of fluid dispensers.

51. The apparatus of claim **49**, wherein said apparatus includes at least about 20,000 radially arrayed reaction sites.

52. The apparatus of claim **49**, wherein said fluid dispenser is adapted to convey an amount less than about 0.5 μl of said fluid to each of said reaction sites.

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